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IT Literacy: The Idea of Emergent Literacy in IS Education

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ABSTRACT

The IS field has been unresponsive to the calls from other fields for better IT literacy education. This paper examines the concept of IT literacy from the point of view of the IS field. It distinguishes IT literacy from computer literacy and from the more recent concept of “information literacy.” A novel conception of IT literacy based on anthropological literacy studies is proposed. This concept of “emergent IT literacy” describes literacy with IT, not as skills to be gained, but as a social practice of controlling the environment with the help of technology. Emergent IT literacy provides a cogent foundation for the IS introductory course. This paper argues that many of the recent disasters including the aftermath of hurricane Katrina could have been better managed if the responsible parties had better IT literacy.

Keywords

IS Education, computer literacy, IT literacy, emergent literacy.

INTRODUCTION

IS research rarely address the issue of computer or information technology (IT) literacy. Perhaps this paucity of research in IT literacy can be attributed to the aversion IS researchers have for research on the IT artifact (Weber, 2003). Or perhaps IS research assumes that IT literacy is synonymous with computer literacy, and computer literacy is exclusively a concern of computer science. Whatever the rationale, IS education has suffered from this lack of focus. Weaknesses in IS education impact the growth of the field and its ability to contribute to other fields and society in general. An example of such a weakness in IS education is the poorly-conceived introductory MIS course (Holmes, 2003; Kroenke, 1988). The goal of this study is to show how IS education is impacted by a misconceived notion of computer literacy and how a revised view of IT literacy can remedy this weakness in IS education. This paper will also argue how this revised view of IT literacy can enhance the IS field in the eyes of society.

THE COMPUTER LITERACY MOVEMENT

As the personal computer (PC) became popular in the 1980s and PCs were used as instructional tools in schools (Bork, 1985), calls for computer literacy could be heard from every corner of society. However, it was not clear what was meant by computer literacy (Cohen, 1987; Harvey, 1983). The term “computer literacy” has recently fallen into disrepute (Bartholomew, 2004; Childers, 2003). Its meaning has evolved so rapidly that the term has lost its significance.

In the 1970s, Nevison (1976) at Dartmouth College coined the term “computer literacy” as a means of promoting computing in liberal education. Nevison’s choice of the term “literacy” was instrumental to the preservation of the computer literacy movement because, as in general literacy, the term implies a level of competency that everyone should achieve (Jones, 1991). As computer usage proliferated, computer literacy evolved to imply the need for society to be concerned with its increased use in society (Hoffman & Blake, 2003). In the 1980s, Time Magazine named the computer as its Man of the Year. As technology improved, the meaning of computer literacy shifted again to mean an ability to accomplish everyday tasks using the computer in the same way as people drive automobiles without necessarily needing to know how it works (Halaris & Sloan, 1985). By the 1990s, proficiencies in at least one microcomputer operating system and several software packages such as word processors, electronic spreadsheets and databases was accepted as computer literacy (van Vliet, Kletke, & Chakraborty, 1994). As a result of the Internet revolution in the late 1990s and early 2000, this notion of computer literacy became outdated again and “information literacy” was coined to include the ability to manage the deluge of information from the Internet as an extension to computer literacy (Childers, 2003; Hoffman & Blake, 2003). The Association of College and Research Libraries define the concept of “information literacy” as “the set of skills needed to find, retrieve, analyze, and use information” (Association of College & Research Libraries, 2003) in the Information Age. “Information literacy” enables one to become lifelong learners and to be able to learn how to learn. Although useful within the context of locating and synthesizing information within the domain of the Library and Information Science field (Spitzer, Eisenberg, & Lowe, 1998) it is less relevant to the IS field which incorporates technological issues relating to IT.

All of these conceptions are subsumed within the National Research Council's (NRC) new concept called Fluency with Information Technology (FIT) (Lin, 2000). This concept includes computer literacy in the sense of computer application skills but also includes an understanding that would not become obsolete with changing technology. This broader understanding includes an appreciation of the foundations of IT and an ability to use problem-solving capabilities in an IT context. Unlike the earlier conceptions of computer or information literacy, the concept of Fluency with IT was one of the few attempts to incorporate several theories that justify the need for competencies in IT.

THEORETICAL BASES FOR COMPUTER LITERACY

The term "computer literacy" was coined to take advantage of its analogous link with general literacy. Various theories form the basis for general literacy. Literacy has been proposed as the factor that distinguishes "developed" from "backward" societies (Havelock, 1976). It has been linked to modernization and the ability of developing nations to achieve democracy (O'Donnell, 1979), increased standard of living and the "only reliable way of combating the social determinism that now condemns them to remain in the same social and educational condition as their parents" (Hirsch, Kett, & Trefil, 1988, p. xii). Hirsch et al., views literacy as the conservative force in society, a "cultural literacy", that is capable of creating a homogenous unit out of a large, diverse group of people such as the one found in the United States. Therefore, according to these theorists, being illiterate is the major impediment to "progress." It is little surprise that the term "computer literacy" was able to gain as much mileage as it did despite being so vaguely defined. The American Library Association (ALA) version of "information literacy" is essentially based of the notion of solving the "information problem" (Eisenberg & Lowe, 1997; Spitzer et al., 1998). The scope of "information literacy" by and large concerns the K-12 and tertiary education student.

The more recent conceptions of computer literacy are based on the same kinds of justifications and as it were, attempt to realize the goals of the same "cultural literacy" as it relates to contemporary technology. For example, the National Research Council's concept of the Fluency with IT is based on four rationale, (1) personal rationale, (2) workforce rationale, (3) educational rationale, and (4) societal rationale. The personal rationale justifies the need for Fluency with IT because IT helps people keep in contact with friends, manage their finances with spreadsheets and online services, help their children with their homework and generally improve their quality of life. The workforce rationale defines Fluency with IT as the minimal requirement for the knowledge worker to be productive and mobile in today's workplace. The educational rationale defines Fluency with IT as the tool and means for access to today's educational resources. Societal rationale defines Fluency with IT as the means for an informed citizen to take part the activities of the technological society, and to receive the rights deserving of them. One of the implications of this view of computer literacy is the need to be familiar with basic IT tools such as word processing, spreadsheets, email and Internet browsers.

Another theoretical framework for computer literacy defines also four arguments (Baron, 1984), (1) acculturation, (2) economic considerations, (3) social mechanisms, and (4) mental discipline. The argument of acculturation states that computers have become part of the culture, therefore an introductory course in computers becomes necessary in order for the individual to function well in society. For example, the acculturation theory supports the need for every individual to understand ethical issues that arise from societal use of computers. Economic considerations are arguments that consider the economic ramifications of computers to individuals, institutions and society. At the individual level, computer skills have today become a requirement for many jobs. The theory of social mechanisms argues that certain societal processes have become necessary activities for preventing or solving social problems. The theory of mental discipline argues that computer skills provide an individual the leverage or "mental muscle" to learn other skills and knowledge. Essentially this theory argues that computers help students improve their technical-rational-problem-solving skills. This approach is essentially an instrumental view of IT which states that IT is a critical "tool" or instrument towards accomplishing goals.

COMPUTER LITERACY AS "SKILLS"

These frameworks have one commonality. Literacy is assumed to be a skill, knowledge or competency to be gained in order for the individual to function in social situations. This view of computer literacy implies the following:

A Computer Skill Can Be Easily Identified

Viewing computer literacy as a skill assumes that a certain set of skills can be easily defined and identified. Once these skills are defined, they can form part of the training towards computer literacy. This view begs the question: What set of skills qualifies one to be computer literate? Depending on the domain in question, different opinions have been given as to what constitutes a "computer skill." For example, during the early development of computer languages, being able to write a program was considered a computer skill (Nevison, 1976). Later, as technology improved this view was considered no longer valid. In the 1980s, more and more CEOs were using computers directly (Rockart & Treacy, 1982) instead of getting information and reports from their subordinates. This phenomenon suggests that these CEOs were becoming more computer

literate. Although a few of these CEOs actually captured keyboarding skills, many of them did not and continued to depend on their functional staff to key in commands or program a database query. Nevertheless, it is safe to say that they either already were competent in some way or had to acquire some form of IT literacy that did not involve the use of keyboarding skills or programming database queries. These “hidden” competencies, which are not necessarily “computer skills,” are not so easily defined.

A Minimal Level of Skill is Required for All People

Another implication of the “skill” view of computer literacy is that everyone should acquire a minimum set of skills that will help them function well in today’s digital environment. The problem with this notion lies in establishing that “minimum.” The set of skills identified as minimum skills today will likely change five years from now. The other problem with this view is related to the nature of the skills that need to be acquired. Is this set of minimal skills suitable for all people, regardless of their level of education and competencies? This is the problem faced by other fields interested in training their members for IT literacy. For example, with the increasing use of IT in health care, the nursing field has struggled to define the minimal level of skills required for nurses. Certain studies (Saranto & Leino-Kilpi, 1997) suggest the minimum level of skills include knowing the features, components and purposes of software, being able to work with word processing, email, scheduling applications and other technical skills. Another study reports that most nursing programs have very low expectations for information literacy skills. About half of the undergraduate programs require that their students have word processing and email skills, whereas less than 25% of them require any skills in retrieving from bibliographic databases or use of presentation graphics software, database or spreadsheet applications (Connors, Weaver, Warren, & Miller, 2002). Even within a single field such as nursing, different opinions exist as to what is considered “minimal.”

Computer Skills Can Be Easily Trained

Based on a set of skills that are considered necessary and sufficient, the computer literacy movement claims that such skills can be easily trained in introductory courses. These courses often take the shape of introducing students to hardware, software and applications. The same notion is assumed by introductory courses in the field of IS. In undergraduate programs, these introductory IS courses often form part of the required core courses in most schools of business. These courses appear to accomplish their goals. Training other segments of the population, especially older adults, may not be so easily accomplished. This view of computer training also does not explain why children pick up computer skills faster than adults. If computer skills are easy to learn, adults should perform better than children.

A NOVEL VIEW OF IT LITERACY

These problems with the prevailing concept of computer literacy demands a new look at computers and literacy. An alternative view of literacy offers a more coherent theoretical foundation for computer literacy. This view treats literacy, **not as a prerequisite for practice** (i.e., skills) but **as practice itself**. Scribner and Cole (1981), in their seminal work with the Vai people of Liberia, found different kinds of literary practices involving different symbolic systems and social situations. The Vai people use Arabic language literacy to read the Qur’an and to participate in religious rituals; English language literacy to communicate with one another; and the official Liberian language for official government and business correspondence and events. Each of these literacy practices, not all of which are taught in a school setting, result in different “cognitive consequences” associated with each set of “literacies.” Unlike the development theorists, their research found no clear divide between the so-called “literate” and “illiterate” groups of populations. Certain *illiterate* groups performed equally or better in certain cognitive tasks than the schooled or literate group. In other words, at least for such populations “we cannot and do not claim that literacy is a necessary and sufficient condition for any of the skills we assessed” (p. 251). Essentially their research supports the claim that there is no generalizable minimum literacy rate. They therefore define literacy as:

[A] set of socially organized practices which make use of a symbol system and a technology for reproducing it. Literacy is not simply knowing how to read and write a particular script but applying this knowledge for specific purposes in specific contexts of use (Scribner & Cole, 1981, p. 236).

Instead of literacy as the context for social stability as suggested by development theorists, and as something that needs to be accomplished by everyone, literacy in the view of Scribner and Cole is a practice used in specific contexts for particular purposes as constrained by socio-cultural forces. They do not deny that literacy supports the ability to acquire new skills, but this ability just does not happen spontaneously once a person learns to read. Rather, it is the social practices that literacy is used within that will either help or hinder the realization of those skills.

IT Literacy as Practice

Instead of treating literacy as a skill, Scribner wraps skills along with several other components such as technology and knowledge into the practice of literacy. Writing a letter is an instance of a practice that exemplifies literacy. Having some kind of skill to write a letter is not enough. Writing a letter involves technologies such as the script, materials for writing (such as pen and paper) and a delivery system (the post office); knowledge such as what each word means, conventions such as writing left to right, greetings, and the content that wished to be conveyed; and skills such as encoding language into symbolic form, manipulating a pen, diction, and organizing the body of the letter. Writing an email shares some of the same technology, knowledge and skills; but adds a considerable number of other required technologies, knowledge and skills. Writing an email dispenses with the need to manipulate a pen, but requires keyboarding, word processing and file manipulation skills. As far as technology, there is no need for the post office, but a computer, an email application, and an online connection are required. The person sending the email needs to know if the email was successfully sent and when a reply is received. The knowledge required to email are not typical “skills” that can be taught in a training session. They develop as part of the practice of writing an email.

If Scribner’s conception of literacy as practices is to be taken seriously, two questions arise: (1) What kinds of practices qualify one to be computer literate? (2) How can such practices be developed? Scribner’s description of literacy provides some answers. Scribner and Cole supports the notion that writing systems, as a social invention, are “‘tool systems’ used by men to alter and control his environment” (Scribner, 1968/1997, p. 161); that these social inventions used by man to control and alter his environment as it becomes part of the real world also shapes his mind. Based on this notion, it would not be implausible to suggest that **IT literacy should be viewed as the social practice of controlling the environment with the help of technology.**

IT Literacy as Power

This concept of power and control as part of the literacy practice is supported by Michel Foucault’s interpretation of the relationship between power and knowledge (Foucault, 1980). For Foucault, the relationship between knowledge and power is much closer and interrelated than Francis Bacon’s maxim that power comes from knowledge. Foucault was the first to describe power, not as a destructive and limiting force, but as a positive source that “transverse...and produces things...It needs to be considered as a productive network which runs through the whole social body, much more than a negative instance whose function is repressive” (p. 119).

This interpretation can be applied in the context of IT, specifically to the common notion of “power users.” Users of IT that are considered “power users” are commonly accepted as not only the most knowledgeable of the technology, but also those that can control the technology the most. This notion of controlling the technological environment can be expanded to address the first question: What kinds of practices can qualifies one to be computer literate? The short answer to this question is the practice that enables the person to control his environment of choice. If the technological environment demands that the person write emails, the person needs to be in control of word processing-, file manipulating-, and emailing-related resources. Familiarity with Microsoft Word is useful, but not sufficient, and in certain circumstances, may even be misdirected.

In other words, technical competency with certain application software, if technical competency is defined as proficiency in using such software, should not be the focus of IT literacy, rather, the practice of using computer-based technology in non-specific ways such that the individual has control of and can engage in activities required by his social environment, is the goal of computer literacy. This practice enables one to “hack” their way as they encounter new technologies. This practice not only enables the successful use of technology, but also frees the individual from being limited to use the technology in ways predetermined by others. The notion of “computer literacy” is therefore directly related to the amount of control that one wields with the computer. A writer is not said to be “pen-literate” or “typewriter-literate” just because he knows how to use a pen or a typewriter (Larsen, 1985). Because of the nature of the tool, and its infinite uses and possibilities, the issue of “IT literacy” becomes a real problem because, in most cases, people have limited control of the IT.

This conception of control of and self-confidence with technology to accomplish everyday tasks explains why the notion of computer literacy has evolved so much. In the early mainframe and microcomputer environment, because the only means of accomplishing many of the required tasks meant programming in a specific computer language, therefore, computer literacy implied programming skills. The only means of control of the environment was through the practice of programming. As technology improved, direct programming of hardware no longer became necessary, because control of the resources was enabled by microcomputer software applications.

IMPROVING IT LITERACY: THE CONCEPT OF EMERGENT LITERACY

How does one develop this practice of literacy? Recent developments in understanding how children pick up reading and writing skills answer this question. Heath (1982) defines a "literacy event" as those occasions in which talk revolves around a piece of writing. Children pick up talking skills through these literacy events—either formally as in the school setting, or informally, as when a parent reads to a child before bed. Similarly, computer literacy develops not only by learning programming and application skills; but by how people make use of computers in any engagement with their social environment. **The practice of computer literacy can be said to develop in people as they reconstruct the world through discourse with others in a computer-mediated environment.**

This literacy event concept plays a major role in a recent understanding of early childhood learning and education called "emergent literacy" (Teale & Sulzby, 1986; Whitehurst & Lonigan, 1998). This theory, which is developed from child development, psychology, education, linguistics, anthropology and sociology, replaces the traditional concept of "reading readiness" which assumes that only when a child has mastered a set of basic prerequisite skills can he or she start reading. Reading readiness also implies a sequential process where a child learns to read first before he or she learns to write, and formal instruction is therefore designed accordingly. Unlike reading readiness, emergent literacy assumes that literacy development begins long before formal instruction, as the child starts rudimentary reading and writing behaviors in informal family settings. Both reading and writing develop concurrently as the child participates in different literacy events, rather than sequentially. The development of literacy takes place through active engagement with the world, as people attempt to "get things done" at their own pace, in a variety of ways and at different ages.

Using the notion of emergent literacy, it is possible to speculate why children appear to pick up "computer skills" more quickly than adults. Unlike adults, children interact with computers early in their life, at the same time with their other literacy events such as story telling and reading. Children also work with the computer's different symbolic systems and interface technologies as part of their every day activity, unlike adults who encounter computers mostly at work. All of these events contribute to emerging literacy regardless of the formal instruction kids get from their school. Children therefore excel in tasks that they work on informally, e.g., in chatting with friends, searching for information, keyboarding and mouse manipulations, as they interact with others.

A THEORETICAL FOUNDATION FOR IT LITERACY

A theoretical basis for IT literacy can be formulated based on combining (1) Scribner and Cole's notion that literacy is a practice of exercising power, and that different literacy practices, each with its own symbolic systems, technologies and skills, are a means of people getting control of their specific socio-cultural system, and (2) Heath's notion of "literacy events" and the notion of emergent literacy as a theory to describe how literacy develops as people engage their environment. This new theory does not imply any need for either programming or skills with applications. It only requires what is necessary for the individual to control the related socio-cultural environment using computer-based tools. The framework for the introductory IS course can be described using Figure 1.

Four elements make up the framework for the introductory IS course: (1) The social practice that puts demands on the individual or group of people, (2) The symbol system that is applied as the individual is engaged in the social practice. A symbol system may be a programming language, an iconic graphical user interface, input data or information produced by the social practice. (3) The technology that is being manipulated in the social practice is the IT component of the social practice which includes hardware and software technologies, communication channels, mouse input devices and screen displays. (4) The emerging literacy as the result of the practice and accomplishing the goals of the social task.

An example of this model in real-life is instructive. Assume that an employee who is unfamiliar with electronic spreadsheets is asked to put together a budget (the demand of the social practice) using one. The employee is familiar with budgeting concepts and the symbols required to accomplish a budgeting task, but he or she is unfamiliar with the symbol system of the electronic spreadsheet (the worksheet, rows, columns, formulas, etc.) and its technologies (file, operating system, worksheet cell, scroll bar, cursor, mouse, windows, memory, hard disk and other hardware and software technologies). Putting together a budget using pen and paper shares some of the same technology, knowledge and skills (organizing columns of numbers, adding rows of budget items, labeling budget items) but adds a considerable number of other required technologies, knowledge and skills. The employee undertakes the tasks, applying whatever symbol system and technology he or she is familiar with to this new social practice. Perhaps by reading a manual, watching someone else perform the task or by instruction, the employee figures out that the cells in the electronic spreadsheet correspond to the cells in the manual worksheets he or she is familiar with. By manipulating the mouse and the keyboard, he or she is able to perform the same tasks, only more efficiently. A practice emerges from this process, which may or may not accomplish the task. The extent to which the task is accomplished can be evaluated by the amount of control the employee has over his or her task. The greater

the amount of control, the more accomplished the task becomes and this virtuous circle is repeated resulting in the emergence of more elements of improved practice.

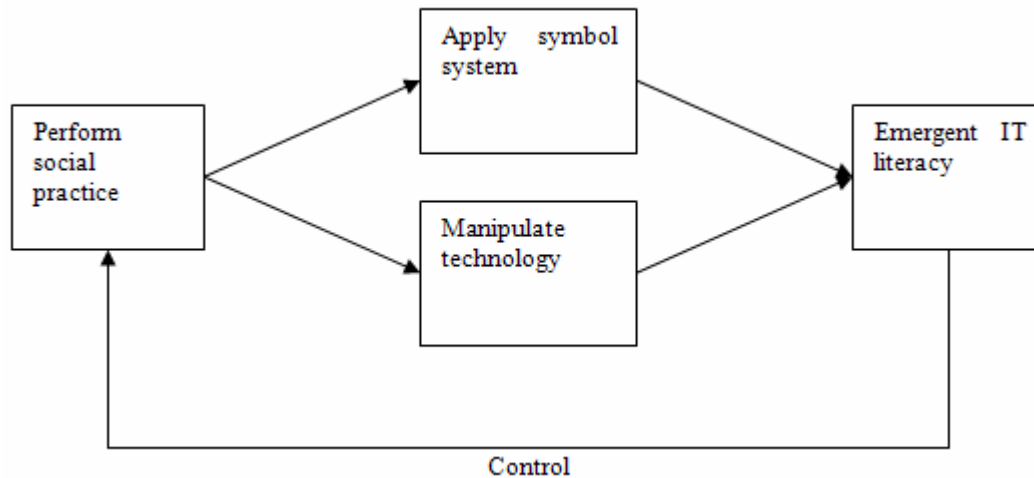


Figure 1: IT Literacy Model

Although the application of the symbol system and the manipulation of technology require knowledge and skills, the nature of the symbol system and the technology being manipulated determines the level of knowledge and skills required. Therefore no general literacy level of knowledge and skills can be universally defined because they are contingent on the demands of the social practice. This contingency is reflected in the fourth element that will be termed “emergent IT literacy.” The level of the emergent IT literacy affects the social practice. If the emergent IT literacy is sufficient, individuals or groups will be able to control the performance of the social practice. The successful completion of the social practice indicates that the individual or group has achieved the necessary IT literacy. If the level of literacy is not sufficient, the level of control is low and the performance will be affected. The individual or group will need to examine the prerequisite resources, the symbol system or technology, and the knowledge and skills associated with both of them to improve their level of IT literacy.

CONCLUSION

Based on this novel conception of IT literacy, any person who is comfortable and in control of IT resources, and is able to accomplish his or her task using IT can be said to be IT literate. In this sense, all CEOs must be IT literate because the control of today’s organizational resources is inextricably linked to IT. This does not suggest that the CEO has to be a programmer, only that he or she has control of the practice of accomplishing his or her tasks with the help of IT. The manager also needs to understand what IT is capable of accomplishing. Much of the mishaps, disasters and problems experienced today such as problems with the accuracy of intelligence from federal intelligence agencies, the tragedy of 9/11, the miscommunication and mismanagement of the aftermath after hurricane Katrina, and the high cost of healthcare, can be traced back to the inability of management taking advantage of IT resources.

The organizations in charge of the evacuation during Katrina and the subsequent search and rescue tasks could have taken advantage of IT resources available to them. The Department of Homeland Security (DHS), with the virtually unlimited information and communication (ICT) resources at their disposal could have raised the sense of urgency, communicated that sense of urgency to the relevant organizations and directed not only the Federal Emergency FEMA in a more effective manner, but other resources such as the National Guard. They could have made projections, produced estimates of casualties and acted promptly based on these projections. But as the Inspector General of the DHS reported (Arnone, 2005), their IT network was so disconnected and ineffective a year before Katrina, that it would have been impossible to activate the DHS’ Emergency Preparedness and Response resources. Essentially, in the context of emergent IT literacy, the leadership of the DHS had little control over their IT resources. The more serious problem is not that their IT resources were ineffective, it was the leadership *not knowing what to do to make their IT resources more effective*. An introductory IS course based on this

theory of emergent IT literacy would have been beneficial in their disaster management and recovery efforts. The reason why they were unable to take advantage of these IT resources is not because they cannot use IT, it is because they are IT illiterate.

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